BUILDING THE ENDOSCOPY WORKFORCE – THE NEED FOR A NATIONAL ENDOSCOPY TRAINING STRATEGY

Report Authors

Dr Neil Hawkes, MB.BCh, MSc (Med Ed), FRCP(UK). Consultant Gastroenterologist and Clinical Lead of the Welsh Endoscopy Training Network.

Dr Neil Warren, BSc (Hons), PhD. Dip(Med Ed). Director and senior lecturer, Welsh Institute for Minimal Access Therapy.

Phedra Dodds, BSc (Hons), IP, RNA. Consultant Nurse for endoscopy and gastroenterology, JETS Workforce Lead (Joint Advisory Group on GI Endoscopy).

Executive Summary

Gastrointestinal (GI) endoscopy is an important tool in early diagnosis of cancer, allows tissue diagnosis and therapeutic intervention. Demand for endoscopy services has risen across the all parts of the United Kingdom, in response to referral guidance [NICE Clinical Guidance 12], public awareness campaigns and the introduction of population-based bowel cancer screening programmes. To achieve goals of further reduction in mortality from all GI cancers, the capacity of endoscopy services across all Health Boards in Wales needs to increase.

Strategic planning for the expansion of endoscopy services requires accurate demand and capacity data, agreed productivity metrics, detailed information on the endoscopy workforce and an analysis of the training infrastructure required to build and sustain a high-quality endoscopy service.

Nationally the Joint Advisory Group in Gastrointestinal Endoscopy (the JAG) provide accreditation standards for endoscopy units and certification requirements for individual endoscopists. The advent of the National Endoscopy Database (NED) will provide real-time data on the quality of performance of units and individual endoscopists across all regions of the UK. Competency-based training,

supported by dedicated and skilful trainers, will be required to develop a workforce operating across all endoscopic specialities capable of meeting these performance standards.

This report summarises what endoscopy training resource is available in Wales, how training needs of an expanded endoscopy workforce may develop, identifies the elements of a National Endoscopy Training programme, key strategic goals and funding requirements. Without a properly developed national endoscopy training strategy and updated training scaffold, endoscopy workforce expansion required to meet capacity issues is unlikely to be deliverable in the required timeframe.

INDEX OF CONTENTS

Predicting the shape of the future endoscopy service in Wales

1. Demand for endoscopy services across the UK has increased in response to referral guidance [NICE Clinical Guidance 12] (1), public awareness campaigns and the introduction of population-based bowel cancer screening programmes.
2. The introduction of Faecal Immunochemical Testing (FIT) to the Bowel Screening Wales (BSW) programme and the extension of the age range being offered screening, in addition to a baseline increase in demand due to demographic population change is predicted to increase demand for endoscopy by 20% by 2020 (2).
3. Health Education England, in response to similar service pressures on Endoscopy services in England, commissioned the Centre for Workforce Intelligence to produce a report 'Securing the future workforce supply - Gastrointestinal endoscopy workforce review' published in March 2017 (3).
4. Five Endoscopy Units in Wales – in Brecon, Haverfordwest, Carmarthen, Aberystwyth, Llanelli and Bridgend - achieved JAG accreditation. Other Units across Wales have not met requirements due to waiting times, which are linked to capacity issues. Some Units will require redesign if this is to be achieved.
5. Increasing the capacity of endoscopy units across Wales, either by increasing the number of sessions worked across a 24-hour period, including weekend lists or by increasing the number of endoscopy theatres will require an increase in the complement of endoscopy nurses and administrative staff support and changes either to the pattern of list provision by existing endoscopists, or an increase in the number of endoscopists.

6. Strategic planning needs to ensure a competent, well-trained endoscopy workforce that provides high-quality and timely patient-centred care, with effective outcomes to support the requirements of the Cancer Delivery Plan for Wales (4).

Overview of the endoscopy workforce

7. In 2017, the JAG included in the Global Rating Score questions relating to workforce and pressures on the service. Their report 'Endoscopy in 2017: a national survey of practice in the UK' (5) details the summary data for the number of GI endoscopic procedures (table 1) and contributions from different endoscopists to the service (table 2).

Table 1 Number of procedures undertaken during 2016 in endoscopy services (rounded to nearest 1000 procedures, blank squares have <1000 procedures performed)

Procedures	England NHS acute (n=215)	England NHS non- acute (n=34)	Northern Ireland (n=11)	Scotland (n=43)	Wales (n=19)	England independent sector (n=162)	Total (n=484)
OGD (Oesophagogastroduodenoscopy diagnostic and therapeutic)	937 000	35 000	23 000	104 000	37 000	99 000	1 235 000
Colonoscopy (including BCSP)	670 000	23 000	18 000	83 000	27 000	90 000	911 000
Flexiblesigmoidoscopy (including BCSP)	416 000	17 000	6000	30 000	16 000	34 000	519 000
Any type enteroscopy	5000						5000
ERCP (Endoscopic Retrograde Cholangiopancreatography)	53 000	1000	1000	7000	2000	1000	65 000
Endoscopic ultrasound	27 000		1000	2000			30 000
Capsule endoscopy	12 000			1000		1000	14 000
Bronchoscopy	46 000	1000	2000	4000	2000	1000	56 000
Cystoscopy	105 000	12 000	2000	15 000	4000	23 000	161 000
Hysteroscopy	3000	1000				5000	9000
Colposcopy	1000					1000	2000

These data show the number done in the endoscopy unit and not the whole organisation (so excludes radiology, theatres and so on).
BCSP, Bowel Cancer Screening Programm; NHS, National Health Service.

Table 2 Numbers of endoscopists of different backgrounds employed in different sectors and the average mean number of lists performed per week (in brackets)

	England NHS acute (n=215)	England NHS non- acute (n=34)	Northern Ireland (n=11)	Scotland (n=43)	Wales (n=19)	England independent sector (n=162)
Consultant gastroenterologist	1507 (2.1)	81 (1.1)	44 (1.5)	171 (2.1)	71 (1.5)	838 (0.9)
Consultant colorectal surgeon	989 (1.0)	48 (1.0)	25 (1.1)	133 (1.3)	56 (1.0)	661 (0.8)
Consultant upper gastrointestinal/ hepatobiliary surgeon	475 (0.9)	21 (0.9)	7 (0.9)	56 (1.0)	25 (0.9)	259 (0.6)
Other consultants, for example, radiology	186 (1.3)	2 (1.0)	7 (1.7)	22 (1.1)	13 (1.5)	136 (0.6)
Nurse endoscopist	620 (2.5)	30 (1.9)	16 (2.3)	76 (2.7)	25 (1.6)	25 (1.20)
Other non-medical endoscopist	36 (1.6)	–	–	5 (3.0)	4 (0.25)	–
GP	51 (1.2)	30 (0.9)	29 (1.5)	22 (1.3)	1 (1.2)	10 (1.5)
Non-consultant grade medical endoscopist	235 (1.7)	7 (1.3)	9 (1.2)	23 (2.0)	8 (1.0)	8 (2.4)
Total	4099	219	137	508	203	1937

GP, general practitioner; NHS, National Health Service.

8. Across the seven Health Boards in Wales there are 19 endoscopy units providing regular NHS Endoscopy services.
9. Management structures for Endoscopy differ widely and staff contributing to the service are drawn from different directorates e.g. Medicine, Surgery, Radiology.
10. Guidance has been published from the British Society of Gastroenterology to provide a UK consensus on non-medical staffing required to deliver safe, quality-assured care for adult patients undergoing gastrointestinal endoscopy (6).
11. The certification requirements for endoscopist and nursing staff performing different type of endoscopic procedures are shown in Table 3.

Table 3. Type of procedure performed as part of endoscopy service and staff requirements

Procedure type	Endoscopist requirements	Nurse requirements
Diagnostic UGI endoscopy	JAG Certification in UGI endoscopy (n=200, JAG course, e-portfolio, S-DOPS*)	Core AWENcf competencies
Diagnostic flexible sigmoidoscopy (FS)	JAG Certification in FS (n=200, JAG course, e-portfolio, S-DOPS*)	Core AWENcf competencies
Diagnostic Colonoscopy	JAG Certification in Colonoscopy (n=300**, JAG course, e-portfolio, S-DOPS*)	Core AWENcf competencies
GI haemostasis	New JAG Certification standards (n=30, JAG course, e-portfolio, sign-off)	Advanced AWENcf competencies
ERCP	JAG Certification standards (n=300, JAG course, e-portfolio, sign off, mentor)	Advanced AWENcf competencies
Advanced mucosal resection	BSG guidelines, JAG recommendations	Advanced AWENcf competencies

Key: **S-DOPS=summative direct observation of procedural skills, **full JAG Certification (provisional certification requires 200 procedures but the endoscopist is not competent to perform polypectomy. JAG is the Joint Advisory Group on GI endoscopy; AWENcf is the All Wales Endoscopy Nurse competency framework.*

12. To assist a deeper understanding of how individual Endoscopy Units can increase their capacity and productivity a more detailed and up to date survey of key information is required. This needs to detail for all Units which endoscopists contribute what sessions and whether additional sessions can be performed by a given endoscopist if capacity is to be expanded. This will allow a better understanding of the gaps in both the number of additional endoscopy sessions required to meet demand, and the nursing complement to support these lists, so assisting workforce planning and training requirements.

Workforce expansion

13. Consultant grade gastroenterologists or GI surgeons provide the largest contribution to endoscopy capacity. Endoscopy sessions within their job plans will vary from 0.5 to 5 endoscopy sessions per week and the type of endoscopic procedure they perform.
14. SAS doctors (specialty doctors, associate specialists, staff grades), research fellows and non-medical endoscopists (nurses, operating department practitioners, radiographers) provide an important contribution to diagnostic endoscopy capacity. Increased flexibility in their job plans makes this element of the workforce important in backfilling endoscopy lists at short notice ensuring no loss of capacity.
15. Health Boards need to urgently explore what additional sessional time can be engineered from its local workforce and what new staff, of various type and grade, may be required to support demand for all types of endoscopic procedure.
16. The time taken to train new endoscopists and endoscopy nurses must be factored into workforce plans. Historically endoscopy trainees spend their first 1-2 years learning upper GI endoscopy and between years 2-5 achieve competency in colonoscopy. Endoscopy nurses will

need up to three months for induction and achievement of core competencies prior to independently assisting during endoscopy sessions.

17. The Welsh Endoscopy Training Network developed the SPRINT programme (Structured Programme for Induction and Training) to accelerate progress in upper GI endoscopy training and demonstrated significant reduction in time to JAG Certification – with most trainees being certified within nine months (7).
18. The SPRINT template for training was used as the basis for Health Education England's Non-Medical Endoscopist (NME) accelerated training programme which provided additional support and training resource and achieved certification for upper GI endoscopy and flexible sigmoidoscopy for the majority of NMEs in seven months (8).
19. Additional ongoing support and mentorship was essential for the non-medical endoscopists for aspects of practice such as lesion recognition and assessment skills and clinical decision-making.
20. Accelerated (SPRINT) training for colonoscopy was explored in a cohort of Welsh Speciality Trainees and delivered central elements successfully but was limited by the availability of colonoscopy training lists in base hospitals. This effect of high service pressure causing constraints on training list provision across Health Boards in Wales must be acknowledged when planning the training of new endoscopists.

Competency of the endoscopy workforce

21. The British Society of Gastroenterologists have set performance standards for upper GI endoscopy (9), colonoscopy (10), endoscopic retrograde cholangiopancreatography (ERCP) (11) and management of large polyps (12).
22. The National Colonoscopy Audit covering 20,085 colonoscopies and 2681 colonoscopists collected from 302 units showed that key performance indicators for colonoscopy in Wales were slightly inferior to those for other home nations (13).

23. Screening colonoscopists who have undertaken additional training and completed a certification process to participate in the Bowel Screening Wales programme have an annual review of their performance and operate within a performance standards framework. Data from this source demonstrates maintenance of high performance with caecal intubation rates of greater than 95%.
24. Local audit data (unpublished) suggests that a 'significant minority' of colonoscopists working within the non-screening colonoscopy workforce are not performing the minimum recommended number of colonoscopies per year and are not meeting BSG performance standards. An estimated 4% of colonoscopy capacity was lost by having to repeat incomplete colonoscopy tests by endoscopists not meeting BSG performance standards.
25. Regional list sharing was explored successfully in the Laparoscopic Colorectal Training Programme allowing Welsh Specialist Trainees to access lists available in neighbouring Health Boards – a similar scheme applied to Endoscopy training may increase effective training list capacity if trainees can be released from their base hospitals.
26. The National Endoscopy Database is now live and endoscopy units across Wales are required to upload data from their electronic reporting systems. This will provide a mechanism for benchmarking endoscopy performance standards against other regions of the UK.
27. The British Society of Gastroenterology Endoscopy Quality Improvement Programme (EQIP) is designed to promote ongoing improvement of endoscopists and endoscopy services. An EQIP meeting of ERCP practitioners across Wales has agreed a framework for improvement of services and wider sharing of key performance outcome data.

Existing resources to train different levels of staff

28. In 2006 the Welsh Endoscopy Training Network (WETN) was founded to provide access to hands-on endoscopy training courses and establish a JAG-approved Regional Training Centre.

The administrative hub was based at the Welsh Institute for Minimal Access Therapy (WIMAT) with clinical centres in South East, West and North Wales.

29. WETN has trained more than 1000 endoscopists since its inception and WIMAT has gained an international reputation as a centre of excellence for simulation and endoscopy animal tissue model production and validation (14, 15).

30. Over the past decade training leads have led the development of a range of JAG courses targeting various stages of endoscopy skills development (table 4). The WETN led the UK-wide validation process of the JAG polypectomy course in conjunction with training lead from other Regional Training Centres and is actively engaged in a similar process for the standardisation of the JAG Haemostasis course. This process ensures high quality teaching materials, standardisation of course design and quality assurance framework for course delivery.

Table 4. Type of courses developed to support endoscopy training at various performance levels

Pre-certification courses	Core therapy courses	Upskilling and Sub-speciality courses
Simulation courses (pre-ST experience)	JAG GI haemostasis course	ERCP Foundation course
Upper GI SPRINT programme	JAG Core Upper GI therapy course	Lesion recognition and assessment course*
JAG Basic Upper GI endoscopy course	JAG Polypectomy course	STEP-UP colonoscopy course**
JAG Basic Flexible Sigmoidoscopy course		Hi-FIVE - Human factors and team training
JAG Basic Lower GI endoscopy course		Training the Endoscopy Trainer

**Course materials in development – Upper GI and Lower GI versions aimed at senior trainees and independent practitioners. **Longitudinal training programme proposed for upskilling independent colonoscopists.*

31. In association with the Welsh Endoscopy Nurse Training (WENT) committee a complete set of training courses to support the development of competencies mapped to the All Wales Endoscopy Nurse competency framework (AWENcf) [Table 5].

Table 5. Type of courses developed to support endoscopy nurse development (mapped to AWENcf)

ENDO 1	ENDO 2	ENDO 3
SECTION 1 & 2 AWENcf Competencies 1.1-1.5 and 2.1-2.9	Section 3 AWENcf Competencies 3.1-3.10	Section 4 & 5 Competencies 4.1-4.5 and 5.1-5.2

32. National Leadership And Innovation Agency For Healthcare (NLIAH) supported Level 7 training Endoscopy and endoscopy nurse practice modules developed in association with Swansea and

Bangor Universities. This allowed nurses with an interest in developing skills as a nurse endoscopist or leadership roles within Endoscopy Units to gain additional training at 'Masters' level. Alternative models for in-house delivery of Level 7 training are being explored to maximise learning within the workplace, paralleling work completed in other specialities.

The need for a National Endoscopy Training strategy

33. Welsh Assembly Government has acknowledged the accreditation standards for endoscopy services provided by the JAG. Training goals should include JAG certification of endoscopists.
34. A well-trained workforce will deliver higher quality, safer outcomes, and be more likely to deliver increased productivity and diagnostic yields. An example is in the higher yield of detected adenomas during colonoscopy – where every 1% increase in adenoma detection rate (ADR) is linked to improved survival rates from colorectal cancer (16).
35. An investment in training infrastructure for endoscopy is badly needed – no central funding has been given since March 2009. Equipment purchased in 2006 is now outmoded and in some of the original clinical training centres the training environment does not meet JAG quality assurance standards. Course fees contribute partially to covering an administrator salary, but the current programme runs on the goodwill of contributing faculty - this is not sustainable.
36. Detailed workforce data is required to understand the numbers required in different workforce groups, workforce gaps, and the numbers needing training at each level of the service. Tailored training may be required at different levels (table 6).

Table 6. National Endoscopy Training strategy – components required to support the endoscopy workforce

Entry Level	Independent Practitioners	Advanced Practice
Training cohorts of new endoscopists	Updates and endoscopic CPD	Training colonoscopists for BSW assessment
Accelerated training pathways	Upskilling performance	Advanced endoscopy fellowships
JAG courses	Supporting hands-on trainers	Mentorship programmes

37. A National Endoscopy Training strategy should address;

a. Funding settlement for state-of-the-art training equipment

b. Funding settlement for lead faculty members

c. A service-level agreement (once agreement is reached on the site of an upgraded clinical training centre) with Health Board 'ownership' of training facilities, release of sessional time for faculty leads in job plans and maintenance and replacement programme of training equipment.

d. Programming of all prioritised training needs to match requirements of multi-disciplinary workforce development and mandated JAG course provision.

e. An agreed programme evaluation strategy.

38. Several options for training infrastructure support in the setting of a need to expand the endoscopy workforce – the advantages and disadvantages to each of these options are shown (Table 7);

Table 7. Options for training infrastructure support for an expanding endoscopy workforce

Training support level	Advantages	Disadvantages
No change or investment	No cost.	Existing training infrastructure will cease to be able to provide effective training. Threat to maintaining JAG Regional Training Centre in Wales. Inequality in training provision across HBs. Slow progression of trainees through system. No balancing of training need across different levels of endoscopic practice in the workforce.
Target NME cohort training	Costs for commissioning understood. HEE course already proven (for OGD and FS only).	NME trainees will require integration with local systems with ongoing mentorship. Short-term intervention - single cohort addition to service. No resource enters the Welsh training network and disadvantages of 'no change' still apply.
Support for accelerated training in Wales of specified cohorts	Investment to support specific courses to give NME and selected medical trainees rapid training. Some balance to ensure equal selection across HBs is possible.	Short term support for central course elements, no investment in infrastructure. Progress will be slowed by lack of access to training lists in base hospitals. Other 'no change' disadvantages still apply.
Support given for new equipment to replace failed equipment in original clinical centres	Provides a spread of geographical resources to support running courses and central training pathway elements.	Costly to replace equipment in three or four centres – level of resource use is not optimal. Does not provide for faculty sessional time.

Support given for new equipment to replace failed equipment in original clinical centres	Provides a spread of geographical resources to support running courses and central training pathway elements. Maintains an existing WETN structure. Will support a JAG Regional Training Centre (RTC).	Costly to replace equipment in three or four centres – level of resource use is not optimal. Does not provide for faculty sessional time. No plan to address increased training list capacity. No provision for WIMAT support staff costs.
Support for an upgraded National Endoscopy Training Centre	Centres flexible training resource to meet training needs at all levels. Meets JAG RTC criteria. Provides 'best value' in terms of state-of-the-art resource being widely used. Provides the basis for ongoing training of cohorts of trainees in Wales. Incorporate training into an SLA agreement with HB ownership. Create specific training list capacity for national endoscopy training. Links to post graduate centres across Wales and to Imaging Academy.	Cost of training equipment for single upgraded Unit and lead faculty training time. Cost of WIMAT support staff.

39. Key stakeholders within the endoscopy training community propose the following elements as providing a cost-effective, state-of-the-art, integrated National Endoscopy Training infrastructure in Wales to support high quality training over the next decade;
    a. JAG-approved Regional Training Centre status
    b. Use the expertise of WIMAT as an administrative hub, source of technical expertise and to support an endoscopy simulation laboratory.
    c. A single, well-resourced clinical training centre located on the M4 corridor, aligned to a single Health Board with a service-level agreement to provide agreed training capacity as a National Endoscopy Training centre.
    d. A programme clinical lead, nursing lead and deputy leads.
    e. Formally identified Health Board Endoscopy training leads – responsible for co-ordination of 'on-the-ground' training list delivery and organisation of elements of accelerated and other longitudinal training pathways. These appointees would also be expected to play an active role as faculty member on courses.

f. Facilities to enable transmission of training courses from the National Endoscopy Training centre into Postgraduate Training Centres across Wales to allow wider access to high quality training opportunities.

g. Develop an online training library to facilitate 24/7 access to learning resources.

h. Facilitate multi-professional training e.g. links to the Imaging Academy and opportunities for shared training e.g. MDT-style cross-speciality training.

40. A major factor identified by staff within NHS Wales as a barrier to further progression in endoscopy is the cost of mandatory endoscopy training. The central funding for such courses as part of strategic approach to recruitment and retention of Welsh healthcare professionals should be considered and would be likely to reduce training programme administrative costs.

41. The benefits of a state-of-the-art National Training Centre and National Endoscopy Training strategy would be considerable; producing a well-trained workforce, attracting the best endoscopists and nursing staff to Wales; improving staff retention; promoting patient safety; supporting quality improvement projects; strengthening multi-disciplinary networks across Wales; and providing a focus for research and innovative development in endoscopy.

42. The risks of not delivering a National Endoscopy Training strategy that predicts the increased demand on endoscopy services include;

    a. Failure to identify staff requiring training in a timely fashion.

    b. Inequalities in training provision and quality of training across Health Boards.

    c. Slow progression of trainees through the training system.

    d. Missed opportunities to improve clinical networks and the quality agenda.

    e. Failure to attract and retain staff within the endoscopy service.

    f. Endoscopy Service capacity limited by a lack of endoscopists.

    g. No future-proofing of the endoscopy service.

    h. Inefficient use of currently developed training resources.

References

1. Suspected cancer: recognition and referral: NICE guideline [NG12]. (June 2015, updated: July 2017). https://www.nice.org.uk/guidance/ng12
2. Cancer Research UK (CRUK) (2015a) Scoping the Future: an evaluation of endoscopy capacity across the NHS in England [online]. Available at https://www.cancerresearchuk.org/sites/default/files/scoping_the_future_exec_sum_final.pdf
3. Securing the future workforce supply - Gastrointestinal endoscopy workforce review. March 2017. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/597718/Gastrointestinal_endoscopy_workforce_review.pdf
4. Cancer Delivery Plan for Wales 2016-2020. Wales Cancer Network November 2016.
5. Shenbagaraj L, Thomas-Gibson S, Stebbing J et al. Endoscopy in 2017: a national survey of practice in the UK. Frontline Gastroenterology 2018;0:1–9. doi:10.1136/flgastro-2018-100970
6. Dunkley I, Griffiths H, Follows R, et al. UK consensus on non-medical staffing required to deliver safe, quality-assured care for adult patients undergoing gastrointestinal endoscopy. Frontline Gastroenterology Published Online First: 16 May 2018. doi: 10.1136/flgastro-2017-100950
7. Turner J, Hawkes N, Hurley J et al. Accelerated training in upper GI endoscopy—an analysis of SPRINT programme outcomes. United European Gastroenterol J 2015; 2(Supplement 1)
8. Accelerated non-medical endoscopist training programme. https://traverse.ltd/application/files/1215/2044/4540/OPM_NME-Year-1-Evaluation-Report-Final.pdf
9. Beg S, Ragunath K, Wyman A, et al. Quality standards in upper gastrointestinal endoscopy: a position statement of the British Society of Gastroenterology (BSG) and Association of Upper Gastrointestinal Surgeons of Great Britain and Ireland (AUGIS). Gut 2017;66:1886-1899.
10. Rees CJ, Thomas Gibson S, Rutter MD on behalf of: the British Society of Gastroenterology, the Joint Advisory Group on GI Endoscopy, the Association of Coloproctology of Great Britain and Ireland, et al. UK key performance indicators and quality assurance standards for colonoscopy. Gut 2016;65:1923-1929.
11. Wilkinson M et al. ERCP – The way forward, a standards framework. https://www.bsg.org.uk/resource/ercp---the-way-forward--a-standards-framework-pdf.html
12. Rutter MD et al. British Society of Gastroenterology/Association of Coloproctologists of Great Britain and Ireland guidelines for the management of large non-pedunculated colorectal polyp. Gut 2015;0:1–27. doi:10.1136/gutjnl-2015-309576
13. Gavin DR, Valori RM, Anderson JT, et al. The national colonoscopy audit: a nationwide assessment of the quality and safety of colonoscopy in the UK. Gut 2013;62:242-249.
14. Ansell J, Arnaoutakis K, Goddard S et al. The WIMAT colonoscopy suitcase model: a novel porcine polypectomy trainer. Colorectal disease 2013;15(2):217-223.
15. Ansell J, Mason J, Warren N et al. Systematic review of validity testing in colonoscopy simulation. Surgical Endoscopy 2012;26(11):3040–3052.
16. Corley DA, Jensen CD, Marks AR et al. Adenoma Detection Rate and Risk of Colorectal Cancer and Death. N Engl J Med 2014; 370:1298-1306 DOI: 10.1056/NEJMoa1309086